Autonomous Mobile Robot Design

Topic: Research goals for Autonomous Cars

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Autonomous Cars will change our society

- Autonomous car are not a “technology gadget”.
- Autonomous car will change how we commute, what we own, how we share resources as a community, how we experience intelligent machines – robots in our everyday lives.
- To achieve autonomous driving we need to work in every possible field: from control to perception, from path planning to multi-robot collaboration, from robot-human interaction to robot-city integration.
- Don’t miss this opportunity. Get involved!
What we want to achieve here?

- We want to contribute into automating mass commute vehicles.
- We want to contribute into key challenges such as long-term localization, non-cooperative vehicle avoidance, pedestrian detection and intent recognition.
- We want to establish a long-term Education & Research Module in autonomous driving in order to train the required workforce in the field.
What are the short term goals?

- To support our broader goals, two challenges are identified to be addressed in short-term:
  - Challenge 1: Multi-modal sensor fusion for robust long-term navigation.
  - Challenge 2: Pedestrian detection and intent recognition.
- To address these challenges, we seek to develop a skillful research team with the required capacity in terms of background and workforce.
Challenge 1: Long-term Navigation

- The capacity of a perception module to robustly localize the robot pose relies on its capacity to accurately infer this information within any environment.
- To derive a solution to this problem, sensing multi-modality is the key.
- We aim to develop a sensing module integrating:
  - LiDAR rangefinders
  - Multi-camera system
  - Inertial sensors
  - GPS
Challenge 1: Long-term Navigation

- Within our research we will:
  - Develop the multi-modal sensing module emphasizing on time synchronization issues.
  - We will work on the fusion of visual, inertial and LiDAR information as well as GPS.
  - We will emphasize on enabling long-term navigation subject to different light conditions and different places.
  - We will emphasize on validation through labeling of the datasets.
Challenge 2: Pedestrian Perception

- Safe autonomous driving demands autonomous pedestrian avoidance.
- Pedestrian detection may be insufficient and provide very limited reaction time. We as human beings, not only detect but efficiently predict the motion of the pedestrian.
- Within our goals is to enable pedestrian intent recognition: the challenge of estimating the possible trajectory of the pedestrian based on the body motions, eye-inferred intent and more.
Challenge 2: Pedestrian Perception

- Pedestrian detection and intent recognition corresponds to a major challenge in the fields of computer vision, broadly robot perception and machine learning.
- Again, multi-modality will be one of the key avenues to approach a robust solution.
Projects at UNR

- A variety of research projects will run at UNR, including:
  - Autonomous Campus Cart
  - Automating public transportation systems
- Get involved!
- What about a student competition? Inform about your possible interest and share your thoughts!
- Interested? Send an e-mail at kalexis@unr.edu
Thank you!

Please ask your question!